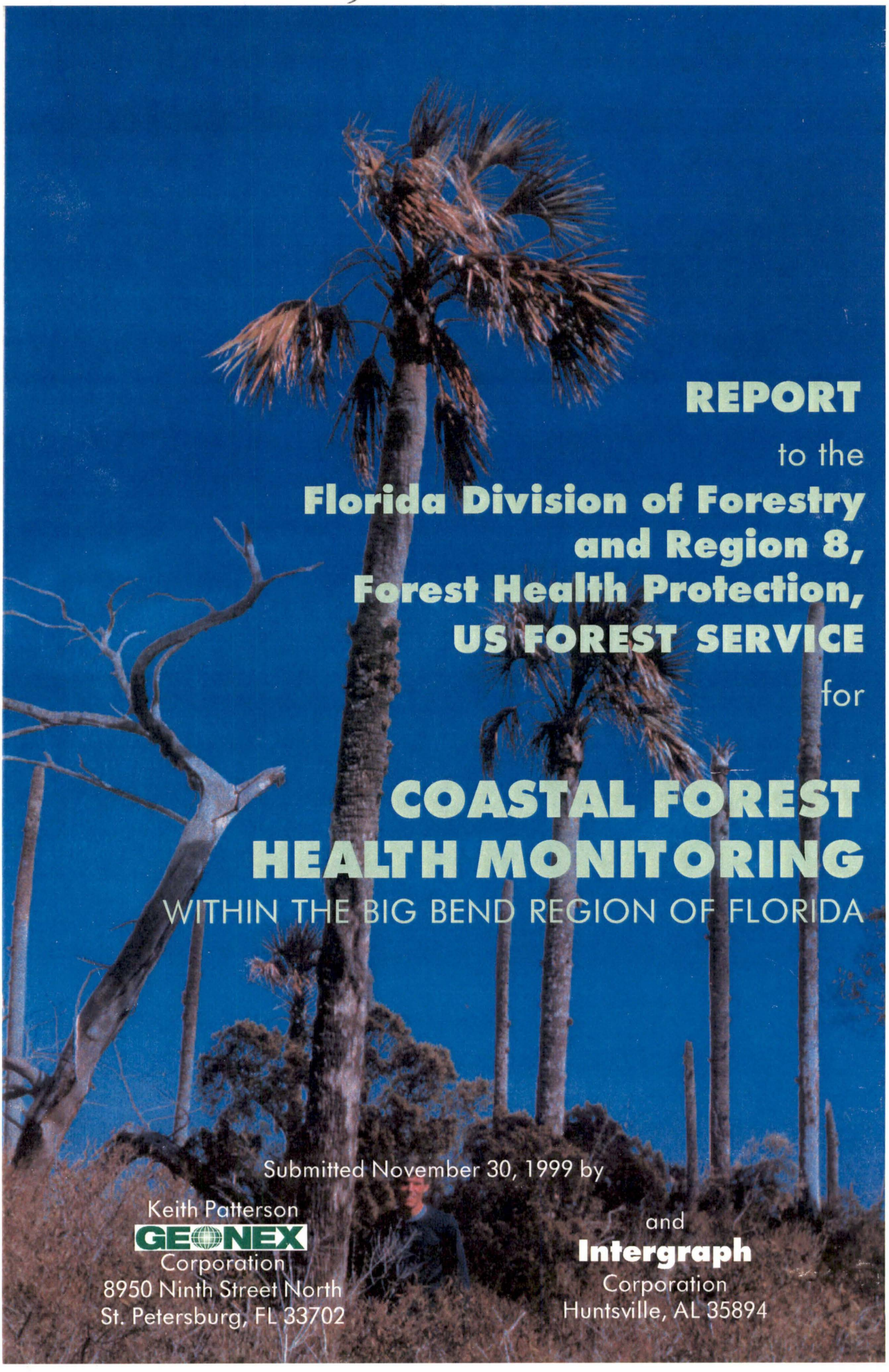
THESIS/REPORTS PATTERSON, KEITH



REPORT

to the

Florida Division of Forestry and Region 8, Forest Health Protection, US FOREST SERVICE

for

COASTAL FOREST HEALTH MONITORING

WITHIN THE BIG BEND REGION OF FLORIDA

Submitted November 30, 1999 by

Keith Patterson
GEONEX Corporation
8950 Ninth Street North
St. Petersburg, FL 33702

and

Intergraph Corporation
Huntsville, AL 35894

REPORT TO THE FLORIDA DIVISION OF FORESTRY

and

REGION 8, FOREST HEALTH PROTECTION, U.S. FOREST SERVICE

for

COASTAL FOREST HEALTH MONITORING WITHIN THE BIG BEND REGION OF FLORIDA

Submitted jointly by:

Keith Patterson
Geonex Corporation
8950 9th Street North
St. Petersburg, Fl 33702

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Huntsville, AL 35894

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1.0 Introduction

The Florida Division of Forestry contracted the work for this project with Intergraph Corporation in accordance with the Florida Department of Management Service contract number 973-544-98-1. Intergraph Corporation then subcontracted the project to Geonex Corporation who completed vegetative mapping and trend analysis of four areas within the Big Bend coastal region of Florida. Specifically, a comparison of 1992 and 1998 aerial photography was accomplished via photogrammetric, photointerpretation and GIS techniques. The project methodology was also designed to facilitate future trend analyses based on new aerial photography acquired at a later date.

The purpose of this report is to document the mapping methodology and results accomplished for the project. The report discusses the methodological approach used for the mapping and trend analysis process. In addition, acreage summary tables and acreage change statistics are included which summarize the results of the trend analysis. Other products produced under this contract are archived at the Division of Forestry and include ARC INFO GIS coverages and hard copy map plots of data produced for the project.

2.0 Scope of Work and Methodology

The following section outlines the procedures and tasks that Geonex utilized for the creation of the deliverables for the project.

2.1 Aerial Photography

The aerial photography utilized for this project was provided to the Florida Division of Forestry by the U.S. Forest Service's Region 8, Forest Health Protection Office in Atlanta, Georgia. Geonex utilized 1992 color infrared aerial photography for the interpretation of the baseline covertype data. Four distinct flight lines were used for the study. The flight lines were not connected with each other and were separated by non-mapped areas. The scale of the photography was 1:6000.

The U.S. Forest Service also provided October 1998 photography at the same scale, emulsion and flightline locations as the 1992 photography so that it could be used for the trend analysis.

In terms of area coverage, the 1992 and 1998 aerial photography was not exactly the same and hence does not overlap in all places. Therefore, the 1992 photos were used to delineate the study area boundary for each strip of photography. The work area boundaries for each strip are equivalent to the extent of stereoscopic coverage of the 1992 photography.

2.2 Photoidentifiable Ground Control Points

Geonex used geographic coordinates derived from USGS digital orthophoto quarter quadrangles (DOQQs) as the ground control for the aerotriangulation of the 1992 photography.

The following DOQQs were used for this project:

Chassahowitzka Bay NE, NW, and SE
Chassahowitzka NE, NW, SE and SW
Withlacoochee Bay NE, NW, and SE
Sumner NE, NW, SE and SW
Yankeetown NE, NW, SE and SW

The pixel coordinate values, which are embedded within the digital orthophotographic imagery, were used as ground control points for the aerotriangulation. Photoidentifiable features appearing on both the digital imagery and the aerial photographs were selected as ground control points.

2.3 Analytical Aerotriangulation

The project's aerotriangulation process was performed by an ASPRS certified photogrammetrist.

The derived ground control points from the DOQQs were marked on the aerial photography using a point transfer device know as a Wild Pug 4 - (model 4963) instrument. Additional photoidentifiable "pass points" (between frames following the flight lines) and "tie points" (between flight line strips) were also selected and marked to complement and intensify the USGS digital orthophoto derived ground control point network.

All control points were permanently marked on the photography by removing a small portion of the film emulsion via a technique known as point transfer, or more familiarly as "pugging." Using the stereo capability, the control point location was duplicated on the adjoining strips of photography and on additional sets of new photography acquired at a later date.

Once all of the points were pugged, their actual positions were measured using the analytical stereoplotter as part of the aerotriangulation process. Aerial camera calibration information, supplied with the aerial photography, was used to complete the aerotriangulation process.

2.4 Classification System

The classification system for this study took into account selected past botanical and in-field forest research conducted by the University of Florida. Past research indicated that selected coastal forest species may be transgressing inland (either through die-off or non-propagation) due to 1) direct exposure of root zones to tidal saline waters; 2) exposure of vegetation to salt spray; 3) increasingly saline soil characteristics; 4) competition with coastal marsh vegetation; and/or 5) unknown or unstudied variables.

The purpose of this study was not to determine why coastal forest transgression may be occurring but rather to 1) confirm that it is occurring; 2) map the location of change; 3) assess the rate (and geographic direction) of change using aerial photography. Furthermore, the Forestry Division has indicated that certain "target" species such as Cabbage Palm *Sabal Palmetto* may be affected more than others.

With these goals in mind we utilized the classification system depicted on the following page for the project.

FOREST HEALTH MONITORING

COVERTYPE	NUMBER CODE	DESCRIPTION
Dominantly Palms	1000	Includes healthy forested communities where *Sabal palmetto* (Cabbage Palm) occupies more than 50% of the covertype
Mixed Forested	2000	Includes all other healthy forested communities, mixed and pure stands, where *Sabal Palmetto* does not occupy more than 50% of the covertype. Typical species include: *Sabal palmetto* (Cabbage Palm); *Liquidambar styraciflua* (Sweet Gum); *Juniperus virginiana* (Southern Red Cedar); *Quercus* spp. (Oaks); *Taxodium* spp. (Cypress), *Tupelo* spp. (Gums), *Maglolia* spp., *Gordonia* spp. *Persea* spp. (Bays); *Acer* spp. (Maples); *Pinus* spp. (Pines); *Carpinus caroliniana* (Hornbeam); *Ulmus* spp. (Elms).
Non Forested, Non Tidally Influenced	3000	Includes non-tidal range land, barren land, freshwater non-forested wetlands, non-estuarine open water
Stressed Palms	4000	Includes areas of 1000 Dominantly Palms that exhibit a significant amount of stress and/or death based on the photographic signature. These are areas of dominantly palm trees that exhibit fronds with less vigor, dead trees, fallen trees, etc, and have a clear indication of naturally caused damage or decline.
Stressed Mixed Forested	5000	Includes areas of 2000 Mixed Forested that exhibit a significant amount of stress and/or death based on the photographic signature. These are areas of mixed forests that exhibit a stressed canopy, dead trees, fallen trees, etc, and have a clear indication of naturally caused damage or decline.
Other Stress Forested	6000	Includes areas of either 1000 or 2000 that have been impacted by fire, hurricanes, pathogens or insects or other obviously documented occurrences that can affect the health of forests.
Salt Marsh and Open Water	7000	Includes all estuarine salt marsh and open water including tidal creeks.
Cultural Land Use	8000	Includes all man made cultural features along with land which has been cleared or planted for future use. This category also includes pine plantations and other agricultural land uses.

2.5 Photointerpretation/Stereocompilation

Photointerpretation for this project was accomplished on a Zeiss P3 analytical stereoplotter. The Zeiss P3 allows stereo viewing of the original aerial photographs and panning/zoom magnification so that accurate and detailed photointerpretation can be accomplished. The stereoplotter is also equipped with the VIDEOMAP option which superimposes the digitized linework over the aerial photograph as the photointerpreter's digitizing occurs.

Covertype boundaries were photogrammetrically digitized using Cadmap/dgn software running on Pentium P200 MMX NT workstations. This software allows for the direct capture of digital data into MicroStation NT (*Bentley Microsystems, Inc.*) for later importation to ARC/INFO.

The minimum mapping unit for this project was one-quarter acre. Any feature smaller than one-quarter acre was not mapped or was included within surrounding polygons.

Stressed trees were identified and photo interpreted as those that were dead and lying down or were still standing but contained no crowns or leaves. The trees that were still standing with crowns exhibiting red photographic signatures were considered healthy.

2.6 Data Conversion and ARC/INFO Integration

Geonex exported the Cadmap/dgn files, produced on the analytical stereoplotter, and imported them into ARC/INFO (*ESRI - Environmental Systems Research Institute Inc.*). Processes for building topology and initializing standard feature attribute tables were controlled by project-specific macros written by Geonex in ESRI's Arc Macro Language (AML).

Four seamless coverages (representing each aerial photographic flight line) were provided as deliverables to the Division of Forestry. The projection of these coverages is UTM (meters), zone 17, NAD 83 with the spheroid of GRS80.

2.7 Trend Analysis

Geonex compared the 1992 aerial photography with the 1998 photography in order to access vegetative changes between the two eras. Although all changes were recorded, particular attention was given to forested vegetation that appeared to be stressed or in decline on the photography.

The 1992 map coverage was photointerpreted first. The VIDEOMAP option was then used to superimpose the 1992 digital file onto the 1998 aerial photography. This allowed the photointerpreters to view the 1992 digital linework superimposed onto the newer 1998 photography. Using a combination of linework editing and re-mapping, the 1998 digital map coverage was created by using the 1992 file as a base.

The photointerpreters used the following strategy while editing the 1992 coverage to create the 1998 coverage:

- In areas where change had occurred, the photointerpreters edited portions of the 1992 linework to depict the 1998 conditions.

- In areas where no change had occurred, the photointerpreters did not edit the 1992 digital linework, thereby keeping unchanged features coincident between data files.

The edited 1992 coverage was then saved as the new 1998 digital coverage so that the two coverages could be compared (digitally) for changes.

2.7.1 Overlaying the 1992 and 1998 Map Coverages

Once the 1992 and 1998 coverages were finalized, GIS analysts compared the two coverages within the ARC/INFO environment. ARC/INFO macros were used along with several different ARC/INFO commands to compare polygons, linears and point features.

The principal behind each GIS overlay comparison was the same: features from the 1992 digital file were tested for a match to the features from the 1998 file. If differences between the coverages were encountered those features were placed in a new coverage and given both the historic feature attribute and the recent feature attribute. Those polygons were then flagged by our AML software as a "change." A digital change map coverage was then generated.

2.7.2 Acreage Summary Tables

Geonex imported the ARC INFO polygon attribute tables for the 1992, 1998 and 1992 to 1998 change coverages into Microsoft Excel tables. These were then reformatted to detail acreage summary statistics by covertype. The tables are provided within the appendix of this report.

2.8 Final Hardcopy Plots

Hardcopy digital plots were produced by Geonex and delivered to the Division of Forestry upon completion of the project. The following maps were produced:

- 1992 Maps – strips 1, 2, 3 and 4

- 1998 Maps – strips 1, 2, 3 and 4

- 1992 to 1998 Change Maps – strips 1, 2, 3 and 4

The 1992 to 1998 change maps contained all of the polygons visible on the 1998 map. Those areas which have changed since 1992 were shaded so that the exact location and extent of change can be viewed on the hardcopy.

3.0 Conclusion

This section gives a brief summary of the trend analysis results. The map coverages, acreage values and acreage comparisons are included within the appendix.

The most frequent change found within the forest health monitoring project was the Mixed Forested to Stressed Mixed forested category. This change occurred in all four of the work areas and was most prevalent within strips 1 and 3. These strips showed about nine and ten acres of change respectively. Another change that occurred relatively frequently was the Mixed Forested to Dominantly Palms category. This change was encountered in strips 1, 2 and 3, and showed about six acres of change in strip 1 and four acres in strip 3.

A change that occurred less frequently in this study included the change from Dominantly Palms to Stressed Palms. The Dominant to Stressed palms category was found in strips 1 and 3, with strip 1 showing about six acres and strip 3 showing three acres of change. Most of the areas that had changed from healthy to stressed trees were areas where forested islands are subjected to tidal influences and/or erosion.

4.0 Appendicies

The following items are included within the appendices in the order listed:

<u>MAPS – Strip 1</u>

1992 Map
1998 Map
1992 to 1998 Change Map

<u>ACREAGE CHARTS – Strip 1</u>

1992 Acreage and 1998 Acreage
1992 to 1998 Changes by Covertype

MAPS – Strip 2

1992 Map
1998 Map
1992 to 1998 Change Map

ACREAGE CHARTS – Strip 2

1992 Acreage and 1998 Acreage
1992 to 1998 Changes by Covertype

MAPS – Strip 3

1992 Map
1998 Map
1992 to 1998 Change Map

ACREAGE CHARTS – Strip 3

1992 Acreage and 1998 Acreage
1992 to 1998 Changes by Covertype

MAPS – Strip 4

1992 Map
1998 Map
1992 to 1998 Change Map

ACREAGE CHARTS – Strip 4

1992 Acreage and 1998 Acreage
1992 to 1998 Changes by Covertype

Florida Division of Forestry
Forest Health Monitoring
Strip 1
Year:1992

Description

- Dominantly Palms
- Mixed Forest
- Non-Forested, Non-Tidally Influenced
- Stressed Palms
- Stressed Mixed Forest
- Salt Marsh and Open Water

Percentage

- 7.02 %
- 11.07 %
- 0.41 %
- 0.73 %
- 1.94 %
- 78.81 %

Acreage

- 297.2408
- 468.2386
- 17.3926
- 30.9981
- 82.1994
- 3333.0037

TOTAL: 4229.073

This data was compiled for the
Florida Division of Forestry
by Geonex
This data was compiled utilizing 1992 1:6,000 scale color infrared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

Sumner Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX

Florida Division of Forestry
Forest Health Monitoring
Strip 1
Year:1998

Description

- Dominantly Palms
- Mixed Forest
- Non-Forested, Non-Tidally Influenced
- Stressed Palms
- Stressed Mixed Forest
- Salt Marsh and Open Water

Percentage

- 7.00 %
- 10.70 %
- 0.41 %
- 0.88 %
- 2.18 %
- 78.81 %

Acreage

- 296.1128
- 452.8882
- 17.3926
- 37.4383
- 92.2376
- 3333.0037

TOTAL: 4229.073

This data was compiled for the
Florida Division of Forestry
by Geonex

This data was compiled utilizing 1998 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

Sumter Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX

Florida Division of Forestry
Forest Health Monitoring
Strip 1
Year:1992 and 1998

Description

- Mixed Forest- > Dominantly Palms
- Mixed Forest- > Stressed Mixed Forest
- Dominantly Palms- > Stressed Palms
- Dominantly Palms- > Stressed Mixed Forest
- Unchanged

Percentage

- 0.14 %
- 0.21 %
- 0.15 %
- 0.18 %
- 99.32 %

Acreage

- 6.0798
- 9.2706
- 6.4402
- 0.7675
- 4206.5153

TOTAL: 4229.073

FLORIDA DEPARTMENT OF AGRICULTURE DIVISION OF FORESTRY

This data was compiled for the
Florida Division of Forestry
by Geonex

This data was compiled utilizing 1991 and 1998 1:6,000 scale color infrared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

Sumner Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX

FOREST HEALTH MONITORING

Strip 1 Acreage

Classifications	Strip 1 1992 Sumner			Strip 1 1998 Sumner		
	Polygons	Acres	% of Total	Polygons	Acres	% of Total
1000 Dominantly Palms	97	297.241	7.029	97	296.113	7.002
2000 Mixed Forested	108	468.239	11.072	103	452.888	10.709
3000 Non-Forested Non-Tidal	12	17.393	0.411	12	17.393	0.411
4000 Stressed Palms	36	30.998	0.733	46	37.438	0.885
5000 Stressed Mixed Forested	90	82.199	1.944	97	92.238	2.181
7000 Salt Marsh and Open Water	33	3333.004	78.812	33	3333.004	78.812
Totals	**376**	**4229.073**	**100**	**388**	**4229.073**	**100**

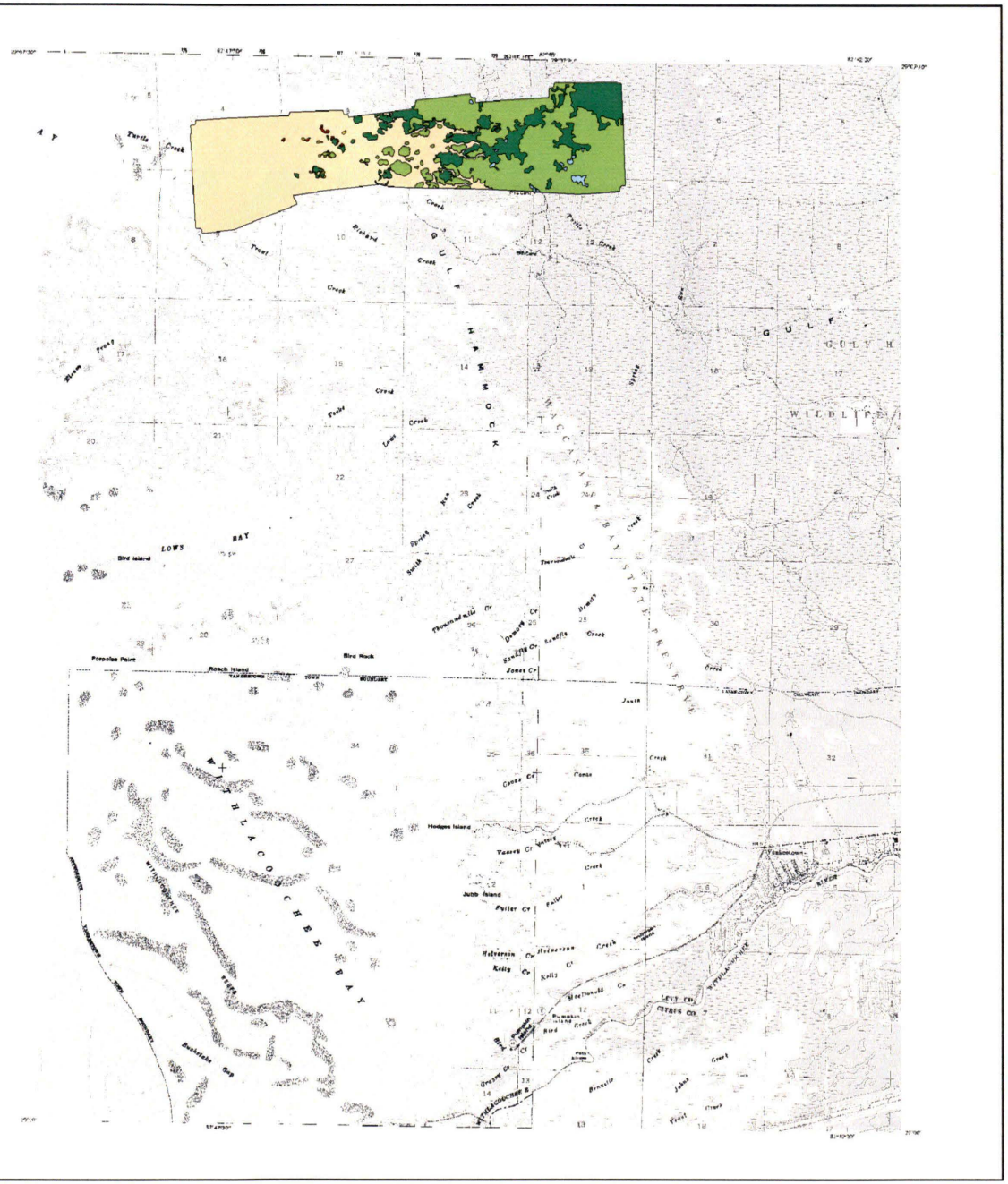
Produced by:
Geonex Corporation
St. Petersburg, Florida

FOREST HEALTH MONITORING PROJECT

STRIP 1
ACREAGE CHANGES

Cover-type Changes 1992 to 1998	Strip 1 - Sumner		
	Polygons	Acres	% total
1000 to 1000 Dominantly Palms No Change	94	290.033	6.858
1000 to 4000 Dominantly Palms to Stressed Palms	15	6.440	0.152
1000 to 5000 Dominantly Palms to Stressed Mixed Forested	6	0.768 ↓7.208A	0.018
2000 to 2000 Mixed Forested No Change	103	452.888	10.709
2000 to1000 Mixed Forested to Dominantly Palms	4	6.080	0.144
2000 to 5000 Mixed Forested to Stressed Mixed Forested	25	9.271 ↓9.271A	0.219
3000 to 3000 Non-Forested, Non-Tidal No Change	12	17.393	0.411
4000 to 4000 Stressed Palms No Change	36	30.998	0.733
5000 to 5000 Stressed Mixed Forested No Change	90	82.199	1.944
7000 to 7000 Salt Marsh and Open Water No Change	33	3333.004	78.812
Totals	418	4229.073	100

Produced by:
Geonex Corporation
St. Petersburg, Florida



Florida Division of Forestry
Forest Health Monitoring
Strip 2
Year:1992

Description

- Dominantly Palms
- Mixed Forest
- Non-Forested, Non-Tidally Influenced
- Stressed Palms
- Stressed Mixed Forest
- Salt Marsh and Open Water

Percentage

- 13.72 %
- 34.84 %
- 0.64 %
- 0.17 %
- 0.19 %
- 50.42 %

Acreage

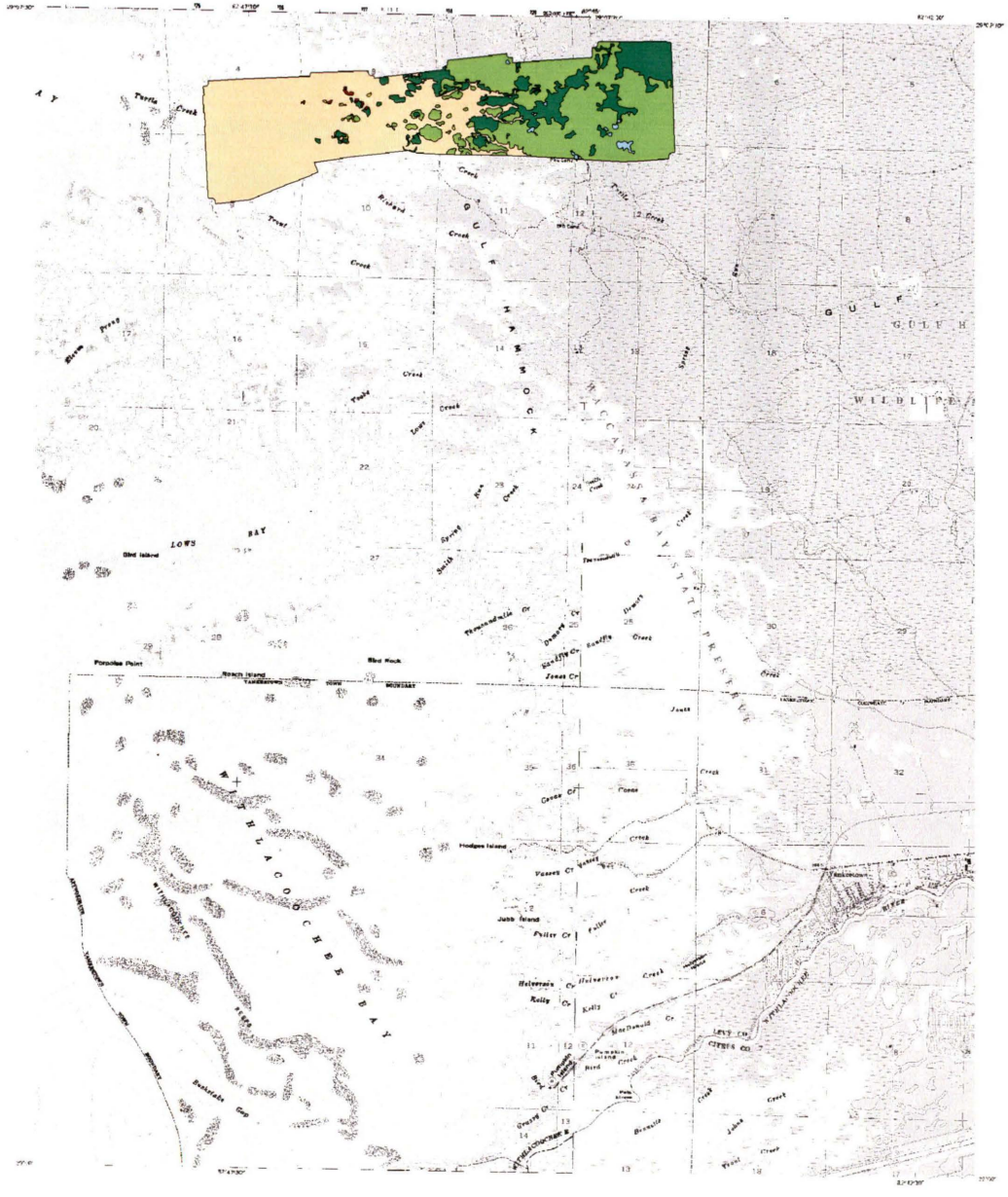
- 227.7064
- 578.0693
- 10.6618
- 2.9281
- 3.2196
- 836.5262

TOTAL: 1659.112

This data was compiled for the
Florida Division of Forestry
by Geonex

This data was compiled utilizing 1992 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

Compiled and Produced by
GEONEX



Florida Division of Forestry
Forest Health Monitoring
Strip 2
Year:1998

Description

- Dominantly Palms
- Mixed Forest
- Non-Forested, Non-Tidally Influenced
- Stressed Palms
- Stressed Mixed Forest
- Salt Marsh and Open Water

Percentage

Dominantly Palms	13.77 %
Mixed Forest	34.77 %
Non-Forested, Non-Tidally Influenced	0.64 %
Stressed Palms	0.17 %
Stressed Mixed Forest	0.21 %
Salt Marsh and Open Water	50.42 %

Acreage

Dominantly Palms	228.5336
Mixed Forest	576.8888
Non-Forested, Non-Tidally Influenced	10.6618
Stressed Palms	2.9281
Stressed Mixed Forest	3.5730
Salt Marsh and Open Water	836.5262

TOTAL: 1659.112

This data was compiled for the
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by Geonex
This data was compiled utilizing 1998 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

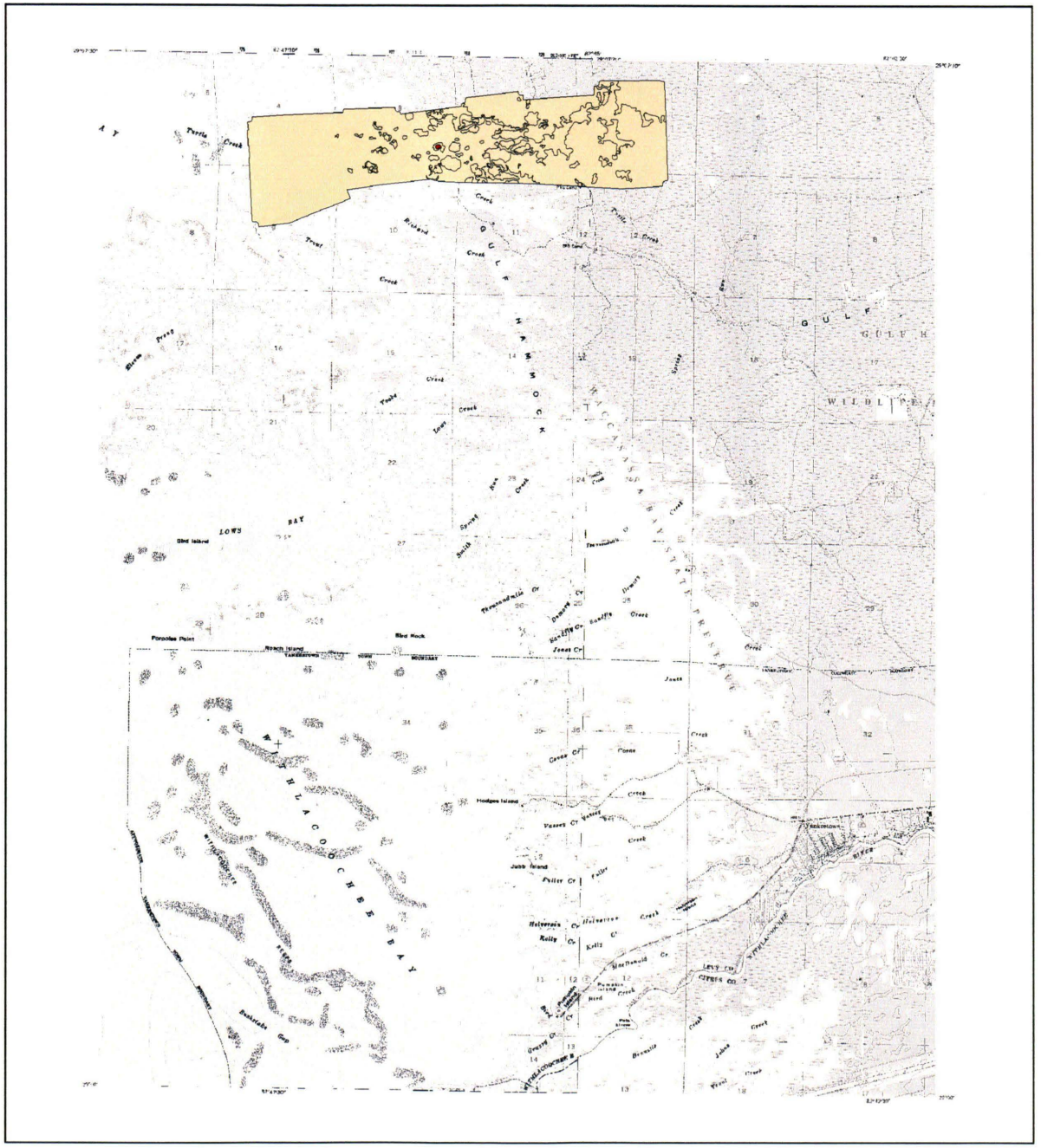
Withlacoochee Bay Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX



Florida Division of Forestry
Forest Health Monitoring
Strip 2
Year:1992 and 1998

Description

- Mixed Forest- > Dominantly Palms
- Mixed Forest- > Stressed Mixed Forest
- Unchanged

Percentage

- 0.49 %
- 0.21 %
- 99.3 %

Acreage

- 0.8271
- 0.3534
- 1657.9312

TOTAL: 1659.112

FLORIDA DEPARTMENT OF AGRICULTURE & CONSUMER SERVICES DIVISION OF FORESTRY

This data was compiled for the
Florida Division of Forestry
by Geonex
This data was compiled utilizing 1992 and 1998 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

Withlacoochee Bay Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX

FOREST HEALTH MONITORING PROJECT

Strip 2 Acreage

Classifications	Strip 2 1992 Withlacoochee Bay North			Strip 2 1998 Withlacoochee Bay North		
	Polygons	Acres	% of Total	Polygons	Acres	% of Total
1000 Dominantly Palms	30	227.706	13.725	31	228.534	13.774
2000 Mixed Forested	27	578.069	34.842	26	576.889	34.771
3000 Non-Forested Non-Tidal	12	10.662	0.643	12	10.662	0.643
4000 Stressed Palms	6	2.928	0.176	6	2.928	0.176
5000 Stressed Mixed Forested	7	3.220	0.194	8	3.573	0.215
7000 Salt Marsh and Open Water	2	836.526	50.420	2	836.526	50.420
Totals	**84**	**1659.112**	**100**	**85**	**1659.112**	**100**

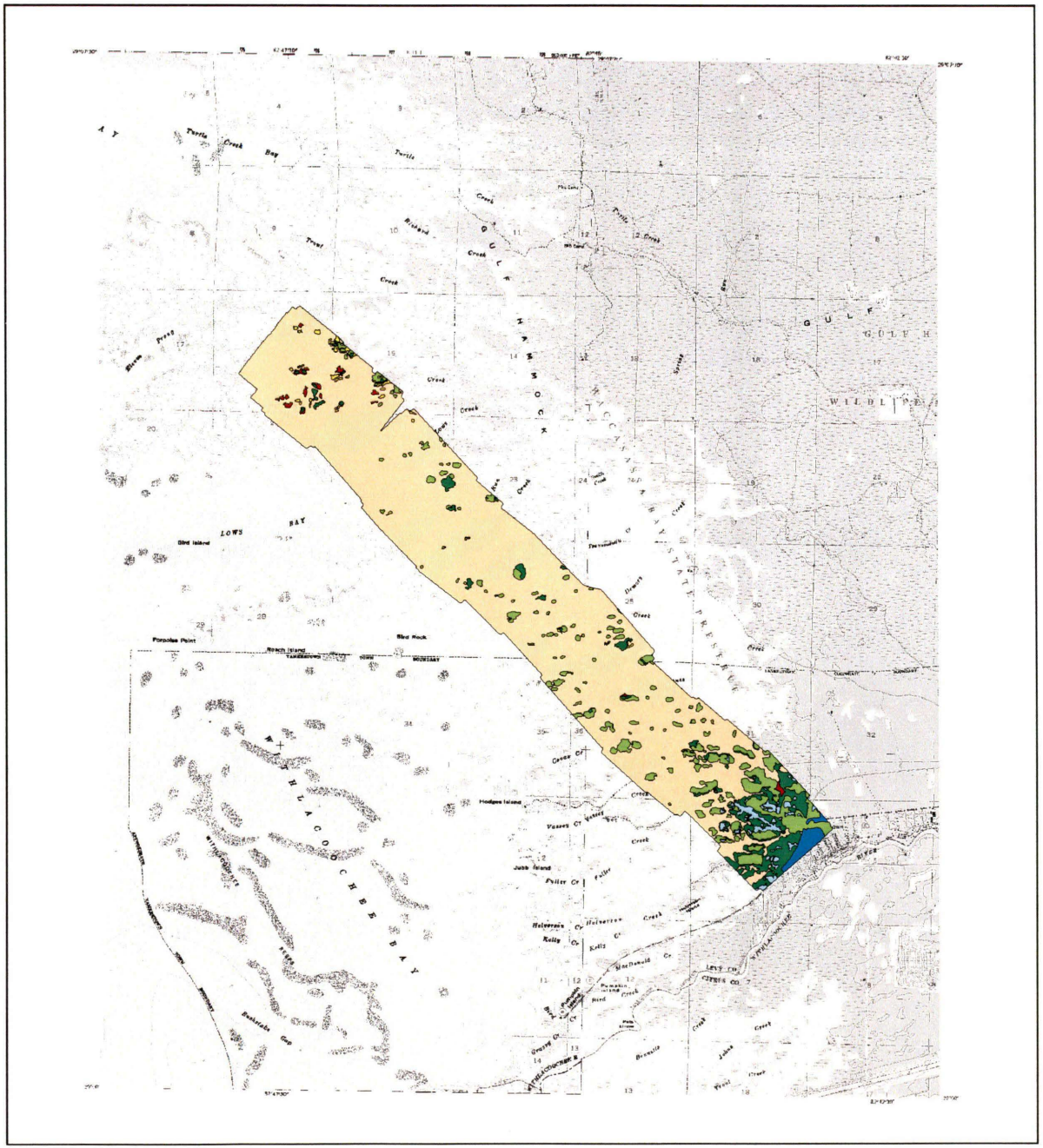
Produced by:
Geonex Corporation
St. Petersburg, Florida

FOREST HEALTH MONITORING PROJECT

STRIP 2
ACREAGE CHANGES

Cover-type Changes 1992 to 1998	Strip 2 - Withlacoochee Bay North		
	Polygons	Acres	% total
1000 to 1000 Dominantly Palms No Change	30	227.706	13.725
2000 to 2000 Mixed Forested No Change	26	576.889	34.771
2000 to1000 Mixed Forested to Dominantly Palms	1	0.827	0.050
2000 to 5000 Mixed Forested to Stressed Mixed Forested	1	0.353	0.021
3000 to 3000 Non-Forested, Non-Tidal No Change	12	10.662	0.643
4000 to 4000 Stressed Palms No Change	6	2.928	0.176
5000 to 5000 Stressed Mixed Forested No Change	7	3.220	0.194
7000 to 7000 Salt Marsh and Open Water No Change	2	836.526	50.420
Totals	85	1659.112	100

Produced by:
Geonex Corporation
St. Petersburg, Florida



Florida Division of Forestry
Forest Health Monitoring
Strip 3
Year:1992

Description

- Dominantly Palms
- Mixed Forest
- Non-Forested, Non-Tidally Influenced
- Stressed Palms
- Stressed Mixed Forest
- Salt Marsh and Open Water
- Cultural Land Use

Percentage

- 4.97 %
- 8.27 %
- 1.37 %
- 0.44 %
- 0.54 %
- 83.43 %
- 0.95 %

Acreage

- 164.7568
- 273.8550
- 45.4579
- 14.7674
- 18.0202
- 2762.5521
- 31.5098

TOTAL: 3310.919

This data was compiled for the
Florida Division of Forestry
by Geonex

This data was compiled utilizing 1998 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

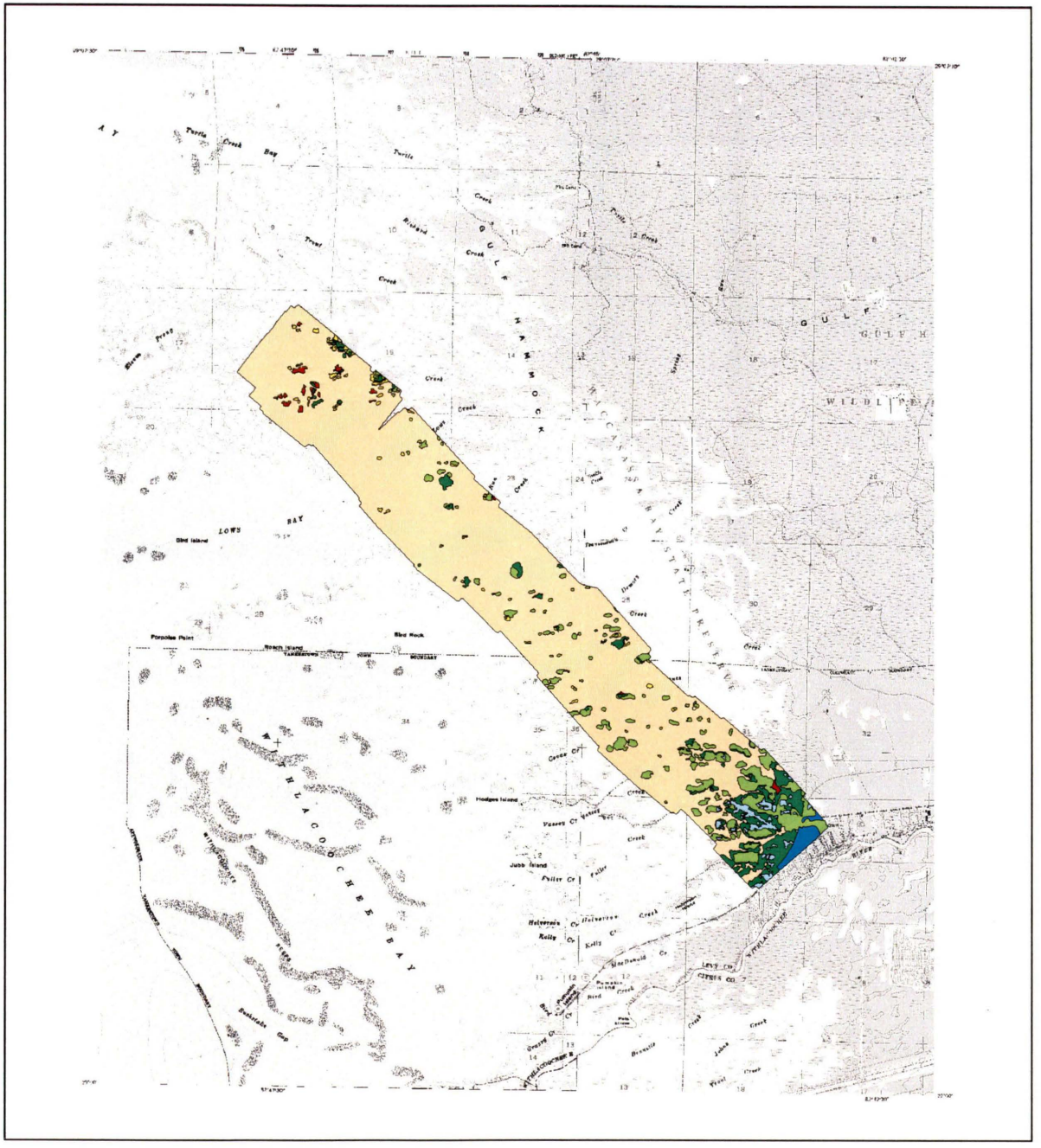
Withlacoochee Bay Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX



Florida Division of Forestry
Forest Health Monitoring
Strip 3
Year:1998

Description

- Dominantly Palms
- Mixed Forest
- Non-Forested, Non-Tidally Influenced
- Stressed Palms
- Stressed Mixed Forest
- Salt Marsh and Open Water
- Cultural Land Use

Percentage

- 5.01 %
- 7.81 %
- 1.37 %
- 0.52 %
- 0.84 %
- 83.46 %
- 0.95 %

Acreage

- 166.2064
- 258.7679
- 45.4579
- 17.4371
- 28.0712
- 2763.4689
- 31.5098

TOTAL: 3310.919

This data was compiled for the
Florida Division of Forestry
by Geonex

This data was compiled utilizing 1998 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

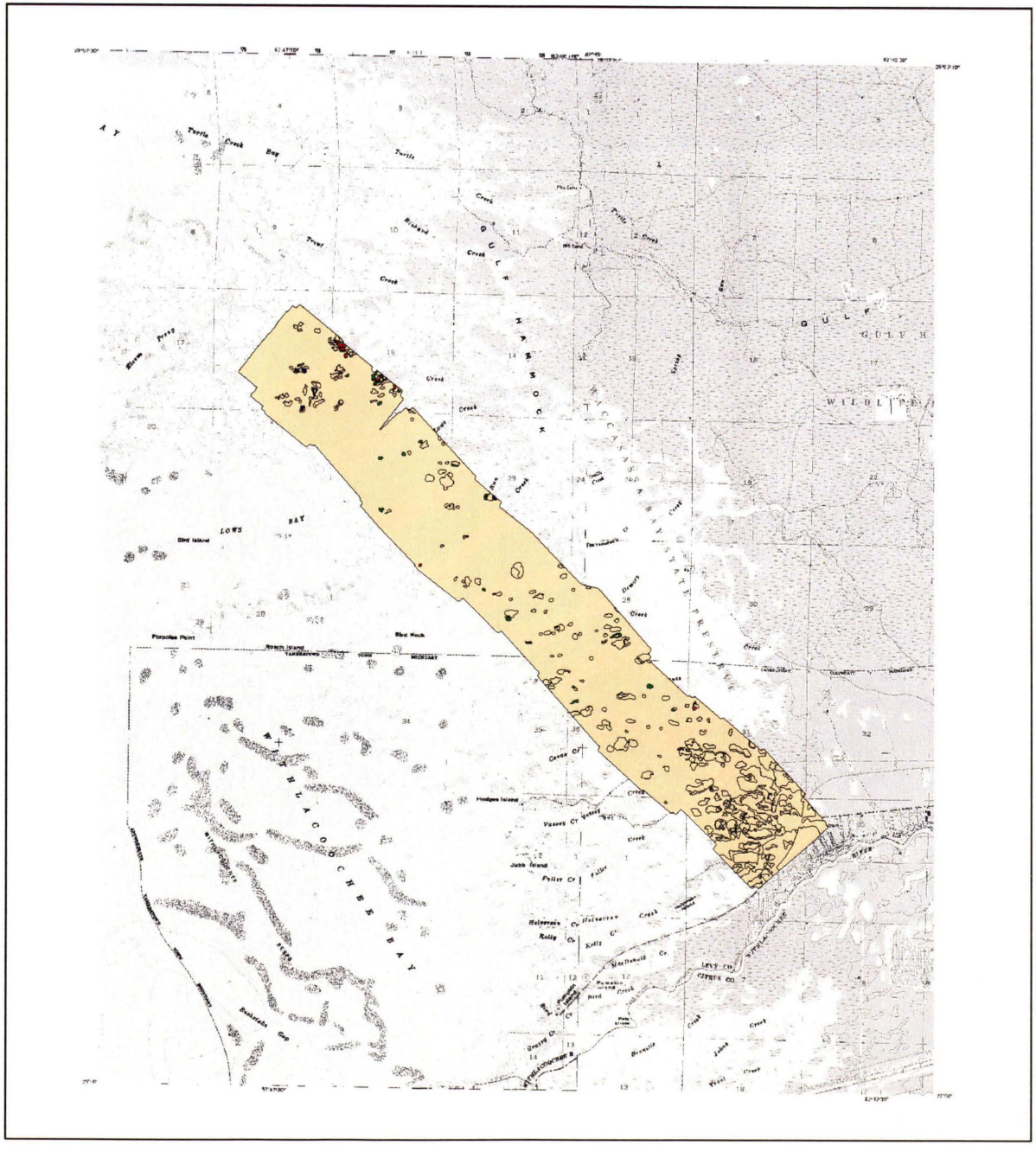
Withlacoochee Bay Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX



Florida Division of Forestry
Forest Health Monitoring
Strip 3
Year:1992 and 1998

Description

- Mixed Forest- > Dominantly Palms
- Mixed Forest- > Stressed Mixed Forest
- Dominantly Palms- > Stressed Palms
- Mixed Forest- > Salt Marsh and Open Water
- Unchanged

Percentage

- 0.12 %
- 0.30 %
- 0.80 %
- 0.27 %
- 98.51 %

Acreage

- 4.1193
- 10.0509
- 2.6697
- 0.9167
- 3293.1628

TOTAL: 3310.919

This data was compiled for the
Florida Division of Forestry
by Geonex
This data was compiled utilizing 1992 and 1998 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

Withlacoochee Bay Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX

FOREST HEALTH MONITORING PROJECT

Strip 3 Acreage

Classifications	Strip 3 1992 Withlacoochee Bay South			Strip 3 1998 Withlacoochee Bay South		
	Polygons	Acres	% of Total	Polygons	Acres	% of Total
1000 Dominantly Palms	41	164.757	4.976	42	166.206	5.020
2000 Mixed Forested	125	273.855	8.271	111	258.768	7.816
3000 Non-Forested Non-Tidal	30	45.458	1.373	30	45.458	1.373
4000 Stressed Palms	14	14.767	0.446	16	17.437	0.527
5000 Stressed Mixed Forested	24	18.020	0.544	40	28.071	0.848
7000 Salt Marsh and Open Water	8	2762.552	83.438	8	2763.469	83.465
8000 Cultural Land Use	2	31.510	0.952	2	31.510	0.952
Totals	**244**	**3310.919**	**100**	**249**	**3310.919**	**100**

Produced By:
Geonex Corporation
St. Petersburg, Florida

FOREST HEALTH MONITORING PROJECT

STRIP 3
ACREAGE CHANGES

Cover-type Changes 1992 to 1998	Strip 3 - Withlacoochee Bay South		
	Polygons	Acres	% total
1000 to 1000 Dominantly Palms No Change	37	162.087	4.896
1000 to 4000 Dominantly Palms to Stressed Palms	5	2.670	0.081
2000 to 2000 Mixed Forested No Change	111	258.768	7.816
2000 to1000 Mixed Forested to Dominantly Palms	7	4.119	0.124
2000 to 5000 Mixed Forested to Stressed Mixed Forested	19	10.051	0.304
2000 to 7000 Mixed Forested to Salt Marsh and Open Water	2	0.917	0.028
3000 to 3000 Non-Forested, Non-Tidal No Change	30	45.458	1.373
4000 to 4000 Stressed Palms No Change	14	14.767	0.446
5000 to 5000 Stressed Mixed Forested No Change	24	18.020	0.544
7000 to 7000 Salt Marsh and Open Water No Change	8	2762.552	83.438
8000 to 8000 Cultural Land Use No Change	2	31.510	0.952
Totals	259	3310.919	100

Prdoced by:
Geonex Corporation
St. Petersburg, Florida

Florida Division of Forestry
Forest Health Monitoring
Strip 4
Year:1992

Description

- Dominantly Palms
- Mixed Forest
- Non-Forested, Non-Tidally Influenced
- Stressed Palms
- Salt Marsh and Open Water

Percentage

- 7.11 %
- 46.29 %
- 0.22 %
- 0.45 %
- 46.32 %

Acreage

- 163.2321
- 1062.5606
- 5.1080
- 1.0463
- 1063.1240

TOTAL: 2295.071

FLORIDA DEPARTMENT OF AGRICULTURE & CONSUMER SERVICES DIVISION OF FORESTRY

This data was compiled for the
Florida Division of Forestry
by Geonex
This data was compiled utilizing 1992 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

Chassahowitzka Bay Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX

Florida Division of Forestry
Forest Health Monitoring
Strip 4
Year:1998

Description

- Dominantly Palms
- Mixed Forest
- Non-Forested, Non-Tidally Influenced
- Stressed Palms
- Stressed Mixed Forest
- Salt Marsh and Open Water

Percentage

	7.11 %
	46.27 %
	0.22 %
	0.45 %
	0.24 %
	46.32 %

Acreage

	163.2321
	1061.9982
	5.1080
	1.0463
	0.5624
	1063.1240

TOTAL: 2295.071

This data was compiled for the
Florida Division of Forestry
by Geonex

This data was compiled utilizing 1998 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

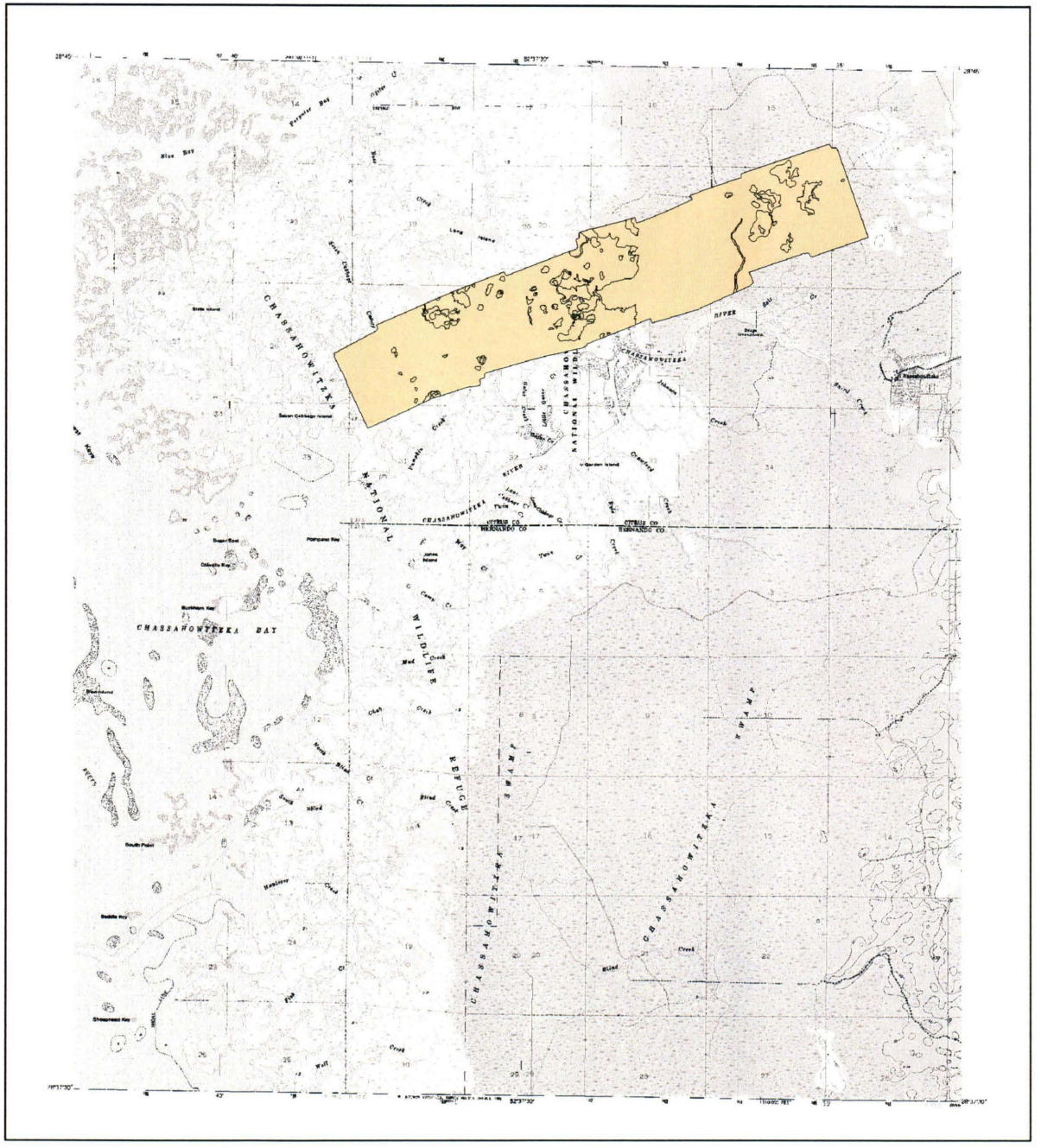
Chassahowitzka Bay Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX



Florida Division of Forestry
Forest Health Monitoring
Strip 4
Year:1992 and 1998

Description

- Mixed Forest- > Stressed Mixed Forest
- Unchanged

Percentage

- 0.24 %
- 99.76 %

Acreage

- 0.5624
- 2294.5089

TOTAL: 2295.071

FLORIDA DEPARTMENT OF AGRICULTURE & CONSUMER SERVICES — DIVISION OF FORESTRY

This data was compiled for the
Florida Division of Forestry
by Geonex
This data was compiled utilizing 1992 and 1998 1:6,000 scale color infared aerial photography. Land base imagery was taken from USGS scanned 1:24000 scale quadrangles.

Chassahowitzka Bay Quadrangle

0 1 2 Miles

Scale: 1:24000

Compiled and Produced by

GEONEX

FOREST HEALTH MONITORING PROJECT

Strip 4 Acreage

Classifications	Strip 4 1992 Chassahowitzka			Strip 4 1998 Chassahowitzka		
	Polygons	Acres	% of Total	Polygons	Acres	% of Total
1000 Dominantly Palms	49	163.232	7.112	49	163.232	7.112
2000 Mixed Forested	17	1062.561	46.297	18	1061.998	46.273
3000 Non-Forested Non-Tidal	7	5.108	0.223	7	5.108	0.223
4000 Stressed Palms	2	1.046	0.046	2	1.046	0.046
5000 Stressed Mixed Forested	0	0	0	1	0.562	0.025
7000 Salt Marsh and Open Water	4	1063.124	46.322	4	1063.124	46.322
8000 Cultural Land Use	0	0	0	0	0	0
Totals	**79**	**2295.071**	**100**	**81**	**2295.071**	**100**

Produced By:
Geonex Corporation
St. Petersburg, Florida

FOREST HALTH MONITORING PROJECT

STRIP 4
ACREAGE CHANGES

Cover-type Changes 1992 to 1998	Strip 4 - Chassahowitzka		
	Polygons	Acres	% total
1000 to 1000 Dominantly Palms No Change	49	163.232	7.112
2000 to 2000 Mixed Forested No Change	18	1061.998	46.273
2000 to 5000 Mixed Forested to Stressed Mixed Forested	1	0.562	0.025
3000 to 3000 Non-Forested, Non-Tidal No Change	7	5.108	0.223
4000 to 4000 Stressed Palms No Change	2	1.046	0.046
7000 to 7000 Salt Marsh and Open Water No Change	4	1063.124	46.322
Totals	**81**	**2295.071**	**100**

Produced by:
Geonex Corporation
St. Petersburg, Florida

GEONEX